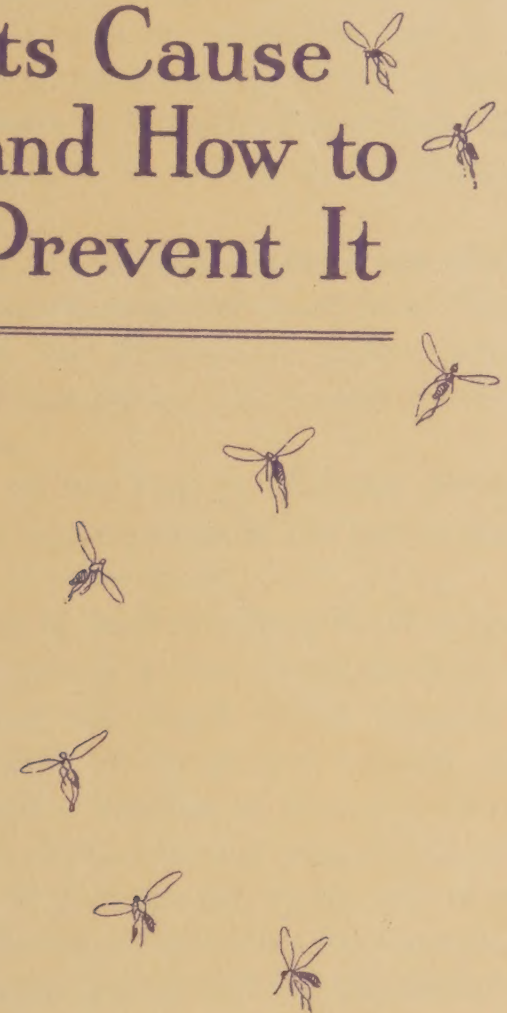
Malaria

Its Cause and How to Prevent It



Published by the

METROPOLITAN LIFE INSURANCE COMPANY

Pacific Coast Head Office
San Francisco

HOME OFFICE
NEW YORK

Canadian Head Office
Ottawa, Ontario

WELLCOME
LIBRARY
P
10334

Wellcome Library
22503590717

MALARIA

What Is Malaria?—A disease that causes a chill, followed by high fever with thirst and headache; the attack may last for only a few hours, but is apt to return every other day, or every third day. Sometimes, when the case is very severe, the patient may have a continuous fever lasting for weeks.

By What Other Name Is Malarial Fever Sometimes Called?—Chills and fever, ague fever, bilious fever, swamp fever, and by other names.

In What Parts of the United States Does Malarial Fever Mostly Occur?—It occurs near the coast from Connecticut to Texas, over most of the Mississippi Valley, and in certain parts of the Pacific Coast States. It is most prevalent in some of the Southern States.

In What Season of the Year Is Malarial Fever Most Apt to Occur?—It is most apt to occur in the late summer and fall, though it may occur at other times.

What Is the Cause of Malarial Fever?—It is caused by the presence of malarial germs in the blood of those having the disease. These germs are small living animals which get inside the red blood-cells of the patient's blood, grow in size, and finally divide into a number of young germs; these may then enter other red blood-cells and repeat the same process. These germs may be seen in the red blood-cells of persons with malaria if the blood be looked at with a microscope.

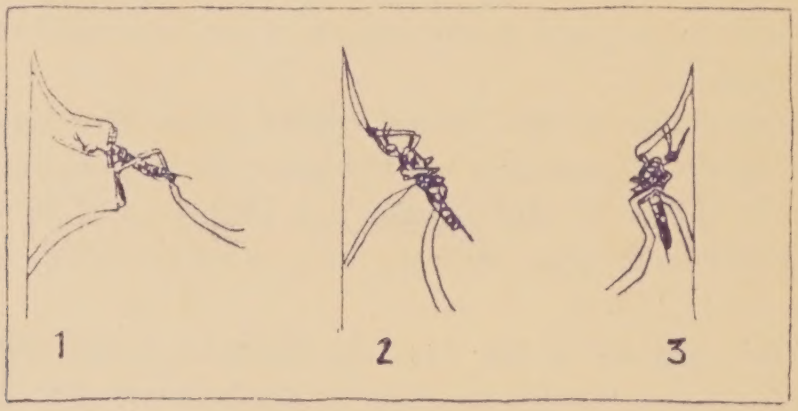
How Do the Malarial Germs Get into the Blood of Persons?—They get into the blood when a person is bitten by the female of a certain kind of mosquito which has, some time before, bitten another person in whose blood the germs were present.

Why Do You Say "the Female" of a Certain Kind of Mosquito?—Because in the United States only the Anopheles mosquito transmits malaria, and probably only the female mosquito bites.

How Does the Mosquito Spread Malarial Fever?—A female Anopheles mosquito bites a person in whose blood there are

malarial germs. She draws blood from this person into her mouth and stomach. When she bites a person after this time, the young parasites which have developed in her get mixed with her saliva and are injected into the person bitten.

What Happens to These Young Parasites After the Mosquito Injects Them into the Person?—Some of the young parasites enter the red blood-cells. They feed on the blood-cells, which at last break down and the young parasites are set free. Each then tries to enter another red cell and repeat the process.



Cut No. 1.—Resting posture of mosquitoes; 1 and 2 Anopheles; 3 Culex pipiens. (After Sambon.)

Is There More Than One Kind of Parasite?—Yes, there are at least three kinds, each of which causes a different kind of malarial fever.

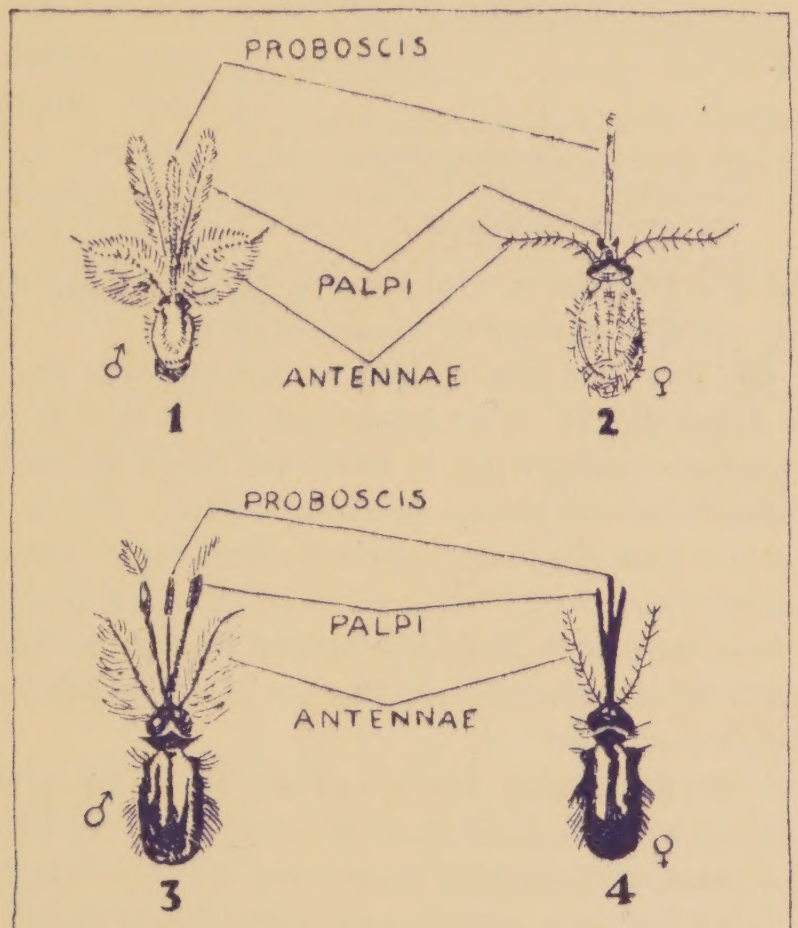
What Causes the Chill and Fever of a Person with Malaria?—When the red blood-cell breaks up, it not only allows the young parasites to escape, but sets free a small amount of a poison, called "toxin," which the parasite has formed. When a large number of cells break up about the same time enough of this poison is set free to cause the chill and fever.

Can Malaria Be Taken in Any Way Other Than by the Bite of an Infected Mosquito?—No; a person cannot get malaria from bad water, food, exposure to the sun, night air, or in any way except by the bite of a mosquito which has, some time before, sucked the blood of a person containing malarial parasites.

What Three Things Are Necessary for the Spread of Malaria?—Persons with malarial parasites in their blood, Anopheles mosquitoes to bite such persons and suck the blood of such

persons, and healthy persons into whom the infected Anopheles mosquito may inject the malarial parasite when she bites them.

Can You Tell the Malaria (Anopheles) Mosquito from the Kinds of Mosquitoes Which Do Not Transmit Malaria?—Yes, in several ways. All mosquitoes have a beak, two palpi next the beak and outside the palpi two antennæ (See illustration below). In the male these are plumelike. The Anopheles mosquitoes have straight bills and palpi almost as long as the bill; the



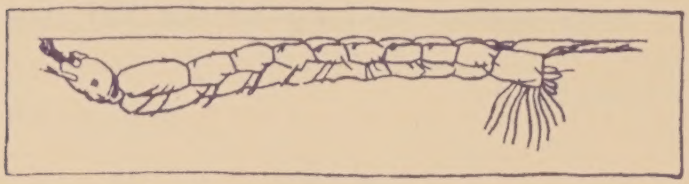
HEADS OF MOSQUITOES; 1 AND 2 MALE (♂) AND FEMALE (♀) CULEX PUNGENS; 3 AND 4 MALE (♂) AND FEMALE (♀) ANOPHELES.

CUT NO. 2.

females of the other kinds of mosquitoes have short palpi. The Anopheles mosquito is slight and graceful and the wings are generally spotted or dusky. When the malarial mosquito is resting on a wall it stands almost on its head, while the other mosquitoes rest "humped up."

Does the Anopheles Mosquito Bite Man More Frequently in the Day or at Night?—She rarely bites in the daytime; she is easily driven off and therefore is most apt to bite when one is asleep.

How Do Mosquitoes Breed?—After having fed on blood the female lays her eggs on the surface of the water, and in a few days these hatch into larvæ or "wigglers." These live in water and after a time turn into pupæ, which finally turn into mosquitoes. All stages in the development of the mosquito must take place in water, and for the Anopheles this requires from twelve to sixteen days in warm weather.



CUT NO. 3—Larva of Anopheles mosquito. (Castellani and Chalmers. Modified after Howard and greatly enlarged.)

How Do You Tell the Anopheles Larvæ from the Larvæ of Other Mosquitoes?—The Anopheles larvæ live at the top of the water and parallel to it, while the larvæ of other mosquitoes hang from the surface head downward. When Anopheles larvæ are disturbed they usually skim across the surface of the water, while the larvæ of other mosquitoes always dive.

Why Is It Important That One Should Be Able to Recognize the Larvæ of the Anopheles?—So that we can find their breeding places and destroy them.

Where Do Anopheles Breed?—They breed by preference in clean water, such as small shallow, shady pools, in the grassy surfaces of small streams and in running water unless running swiftly. They breed in almost any collection of water, unless it is very foul. Generally they avoid barrels, cans, and other containers, unless there is moss, algæ, etc., in them.

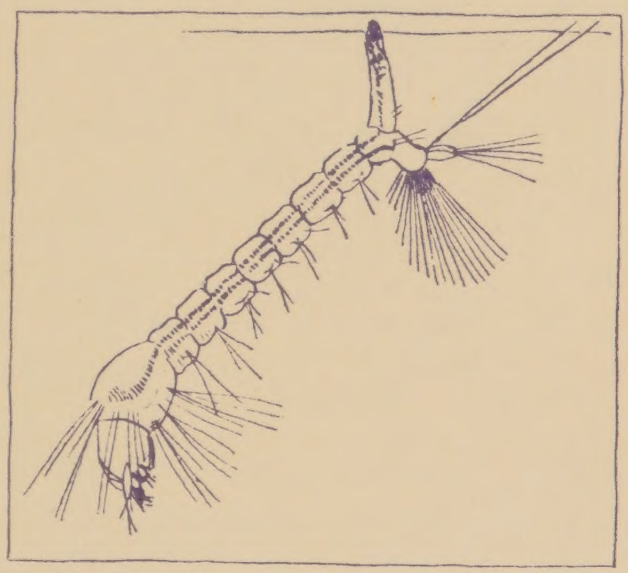
How Long Must the Water Last for Anopheles to Develop?—As it takes about fourteen days from the egg to the mosquito, if the water dries up in less than that time the mosquitoes are not apt to develop.

How Can Malarial Fever Be Controlled or Prevented?—First, by getting rid of the Anopheles mosquitoes which convey it. Second, by preventing these mosquitoes from biting well people. Third, by so treating persons having malarial parasites

in their blood that they will not infect mosquitoes. Fourth, by so treating healthy persons that even if bitten by infective mosquitoes they will not develop malarial fever.

How Can You Get Rid of Anopheles?—By destroying their shelters and breeding places. To do this it is necessary to cut down the weeds and brush around dwelling houses and around the mosquitoes' breeding places. Their breeding places can be destroyed by draining or filling up the pools, marshes, etc., and by oiling such places as cannot be drained or filled. The draining and filling leaves no water in which the mosquito may deposit her eggs, and the oiling forms a film on the surface of the water which prevents larvæ from getting air to breathe, and so they die.

How Often Should Oiling Be Done? — It should be done at least every fourteen days. Some pools are too large to oil, or they may contain grass which prevents the formation of a film; in such cases some means must be adopted to make the water foul and ill-smelling, such as the use of soap-suds, gas-tar, dye-stuffs, etc. Small fish, such as the top minnow, eat large numbers of mosquito larvæ.

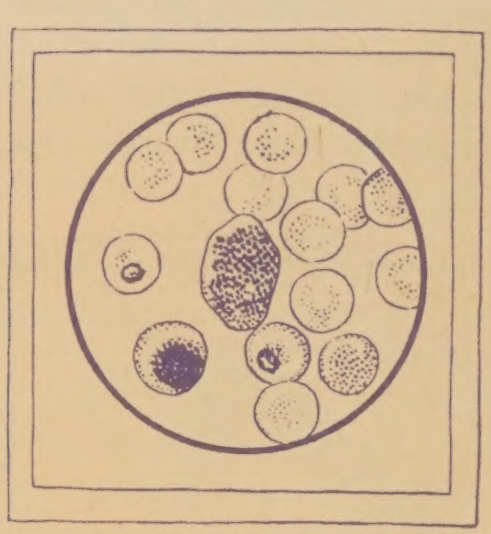


Cut No. 4.—Larva of a Culex mosquito. (After Howard and greatly enlarged.)

How Can You Prevent Anopheles Mosquitoes from Biting Well People?—By thoroughly screening the house and by the use of mosquito-nets. The windows, doors, transoms, and all other openings should be completely covered with wire netting not larger than No. 16. It is important that there be no holes in the screens or that there be no opening. The mosquito bars for beds should be of fine bobbinet, free from holes, and without a side opening; they should go over the head or the footpiece

of the bed, and should be tucked under the mattress and never allowed to hang down to the floor.

How Can Persons Having Malarial Parasites in Their Blood Be Treated So That They Will Not Infect Mosquitoes?—By treating such persons, under the advice of a physician, until they are completely cured and no longer have parasites in their blood, or by keeping such persons in a screened house or otherwise protected from the attacks of mosquitoes.



CUT NO. 5.—Normal red blood-cells, and red blood-cells containing malarial parasites.

How May Healthy Persons Be Treated So That, Even if Bitten by Infective Mosquitoes, They Will Not Contract Malaria?—By taking small doses of quinine, under the advice of a physician, during the malarial season, so that, should such a person be bitten by an infective mosquito, the quinine in his blood will kill the malarial parasites.

How Much Quinine Must Be Taken? — The standard treatment recommended by the National Malaria Committee and approved by the United States Public Health Service is:

For the Acute Attack:—Ten grains of Quinine Sulphate by mouth, three times a day for a period of at least three or four days, to be followed by ten grains every night before retiring for a period of eight weeks. For infected persons not having the acute symptoms at the time, only the eight weeks' treatment is required.

The proportionate doses for children are: Under 1 year, one-half grain; 1 year, one grain; 2 years, two grains; 3 and 4 years, three grains; 5, 6 and 7 years, four grains; 8, 9 and 10 years, six grains; 11, 12, 13 and 14 years, eight grains; 15 years or older, ten grains.

FOOTNOTE.—Acknowledgment is made of the use of material and illustrations from the Report on Malaria by the United States Public Health Service.

332

METROPOLITAN LIFE PRESS

86094

PRINTED IN U.S.A.